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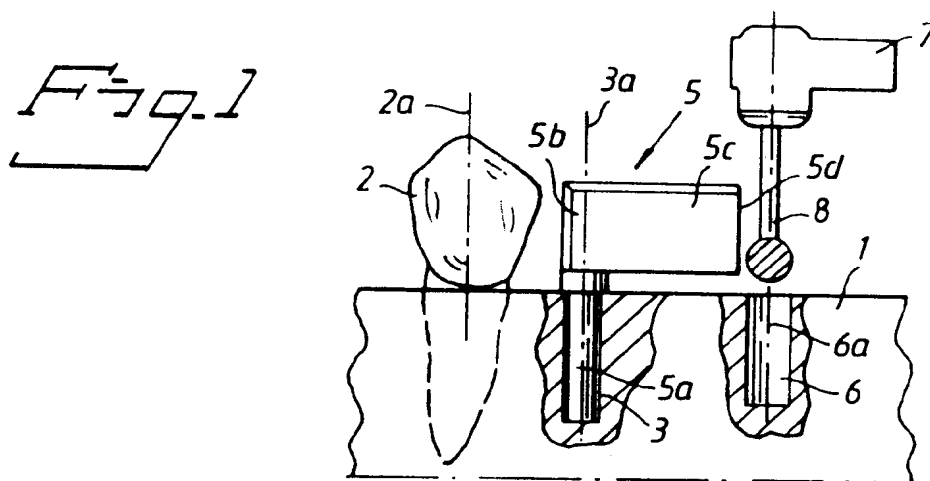
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(54) **Indicating device and method for marking out and forming one or more attachment points for a fixture or fixtures in an area of the human body, preferably the jaw**

(57) An indicating device (5) is used for marking out one or more attachment points for one or more fixtures or fixture parts on an area (1) of the human body. The device can be applied in a receiving hole (3) in which it bears and from which it protrudes via a protruding part (5b). The said protruding part has an indicating section (5c) by means of which distances to one or more neighbouring receiving holes (6) for a fixture or fixture parts can be determined.



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## Description

### TECHNICAL FIELD

The present invention relates to an indicating device for marking out and forming one or more attachment points for one or more fixtures on an area of the human body, preferably in the jaw/dentine. The device can be applied in a receiving hole, here called the first receiving hole (drill hole), in which it bears via a bearing part and from which it protrudes above the said area of the human body via a protruding part. The invention also relates to a method which provides for the said indicating function.

### PRIOR ART

When working with dental implants, the positioning of the fixture is extremely important as regards the possibility of obtaining a good aesthetic and functional result. The positioning of the fixture to a large extent determines the choice of prosthetic components. In order to provide guidance for the surgeon during the installation of a fixture, various types of so-called surgical guide rails have traditionally been used. These guide rails need to be produced under laboratory conditions and they can be made in a number of different designs. As aids during the surgical intervention it is also possible to use so-called direction sensors which indicate the inclination of the fixture to be fitted or the fixture attachment point.

### DISCLOSURE OF THE INVENTION

#### TECHNICAL PROBLEM

Known direction sensors have the considerable disadvantage that they only indicate the inclination of the fixture to be fitted or fixture attachment point and do not provide any information on, for example, the horizontal distance to the next seat/attachment point. The invention aims to solve this problem, among others.

There is also a requirement, in conjunction with the formation of seat holes, to be able to facilitate the formation of the holes or the drilling. This problem too is solved with the aid of the invention by virtue of the fact that the indicating device in question can serve as a support during the formation of holes.

There is a requirement to be able to combine several indicating functions in the same device or in a common system and, in conjunction with the surgical interventions, to offer aids which provide references with respect to both vertical and horizontal distances and also with respect to the state of parallelism. The invention aims to solve this problem too.

There is thus a requirement to be able to optimize in a simple manner the height of the respective fixture/fixture part, and this is made possible by the invention by means of using height markings. In addition, it is desirable to be able to obtain indications on the labial angle

and to acquire information on how the final product will be able to be fitted in the space or spaces in question in or on the dentine/jaw. This matter too is solved in the present invention. It will be possible to provide various indications of distance and inclination by using technically precise and simple aids in the form of one or more devices which in the last-mentioned case can form part of a system. The invention solves this problem too. Thus, for example, possibilities are afforded for simple volume indications for the replacement parts/prosthetic components in question.

The use of previously employed surgical guide rails which need to be produced and used under laboratory conditions can also be dispensed with by means of the invention.

It is also desirable to be able to offer simplified methods for forming holes for fixtures or fixture attachment points in, for example, the human jaw. The invention solves this problem too.

### SOLUTION

The feature which may principally be regarded as characterizing a device according to the invention is that the protruding part mentioned in the introduction supports an indicating section, by means of which distances to one or more neighbouring attachment points for one or more fixtures can be determined.

In a preferred embodiment the said indicating section has one or more surface position markings by means of which the height above the dentine or equivalent can be determined. In a preferred embodiment the indicating device comprises a rod-shaped part which can be pushed into the said first receiving hole, and also a part which is angled in relation to the rod-shaped part and which forms the indicating section and, with its free end surface/edge, indicates the position of the respective desired attachment point in relation to the said receiving hole which itself also forms an attachment point for a fixture or fixture part. The indicating section/the angled part can in this case have the shape of a flag/rectangle/square which is integrated with or connected to the said protruding part. The bearing and protruding parts of the indicating device as well as the indicating section/the flag-shaped part can preferably be rotated together or reciprocally in order to allow the indicating section/the flag-shaped part to rotate to different angular positions in relation to the longitudinal direction of the protruding part and thereby permit optimal adaptation of the respective attachment point for the respective fixture or fixture part. The indicating section or the flag-shaped part is arranged to provide support for the instrument in question, for example a drill, upon formation of a second receiving hole in the dentine or equivalent. The second hole constitutes a seat for the attachment point of the fixture or fixture part in question. The state of parallelism between the longitudinal axes of the first and second holes can thus be determined.

In a preferred embodiment the indicating device can be applied in the first receiving hole, can be pivoted in the applied position for measuring-in the optimal lateral distance to the second receiving hole, and can thereafter be pivoted again for measuring-in a third receiving hole, etc. The indicating device can in addition be provided with a number of height markings for setting the optimal height of the fixture or fixture part above the dentine or equivalent. The indicating section can form the protruding part and can consist, for example, of a rectangular element associated with the bearing part.

Volume references can also be obtained with the aid of the indicating device. In one embodiment the indicating device is designed as a semispherical body with a plane surface for volume markings, which in this case can consist of markings in the form of rings. The increasing volume of the body is indicated by decreasing ring sizes and vice versa.

The indicating device can form part of a system of indicating devices, in which a first type of indicating device is used for indicating essentially horizontal optimal distances between attachment points for one or more fixtures. A second type of indicating device indicates essentially vertical optimal heights for the fixture above, for example, the dentine in question. A third type of indicating device indicates the optimal volume-related (labial) shaping of the fixture or replacement part in question. One or two or all types of indicating devices can in this case be present in various sizes and/or values for the respective indication.

According to the invention, a method is also proposed which uses the indicating device in accordance with the above. The method consists, inter alia, in the indicating device being introduced into a first receiving hole via its bearing part, and in the position or positions of one or more neighbouring second receiving holes being determined with the aid of one or more indicating sections on the indicating device in question. In one embodiment of the method, the indicating section or indicating sections is/are turned about the longitudinal axis of the first receiving hole for marking out the positions for the said two or more second receiving holes. The height of the respective fixture or fixture part is determined with the aid of one or more height markings on the indicating device or the indicating section. A volume reference can also be obtained using the indicating device in question.

#### ADVANTAGES

By means of what has been proposed above, the positioning of the fixtures concerned and assessments of the appearance of the respective implant can be considerably facilitated. Indicating devices with different distance markings permit pre-planning of different fixture positions in a simple manner. This indicating principle can be used independently of the shapes of the dentine and jaw and of the dental status of the patients in question.

#### DESCRIPTION OF THE FIGURES

A presently proposed embodiment of a device and a method according to the invention will be described hereinbelow with reference to the attached drawings, in which:

Figure 1 shows, in a vertical view and partial cross-section, the use of an indicating device in dentine, the indicating device being positioned in relation to a tooth, and an attachment hole for a fixture being marked out and a drill instrument being applied,

Figure 2 shows, in a vertical view, the situation according to Figure 1, but in which another type of drill has been applied in the drill instrument, and in which the shapes of the fixtures have also been shown,

Figure 3 shows, again in a vertical view, the application of an indicating device in relation to an inclined tooth in the jawbone in question,

Figure 4 shows, in a horizontal view, the rotatability of an indicating device according to Figures 1 - 3 for marking out two positions for second receiving holes,

Figure 5 shows, in a horizontal view, the rotatability of the indicating device in relation to a curved shape,

Figure 6 shows, in a horizontal view, the indicating device being rotatable in relation to a tripod shape,

Figure 7 shows, in a horizontal view, the use of an indicating device of a type other than that in Figures 1 - 6, which illustrated indicating device is used for indicating the volume of a planned replacement part,

Figure 8 shows, in a horizontal view, two indicating devices according to Figure 7 arranged alongside one another,

Figures 9a - 9c show, in vertical views, indicating devices according to Figures 1-6 with different lengths of indicating sections,

Figures 10a - 10d show, in vertical views, indicating devices with height markings and volume markings, and

Figure 11 shows, in a vertical view, the height adjustment for fixture attachment points in relation to teeth in dentine.

## DETAILED EXEMPLARY EMBODIMENT

In Figure 1 the jawbone of a human is indicated by 1. A tooth is indicated by 2 and the longitudinal axis of the tooth by 2a. A first receiving hole or drill hole 3 has in this case been made in the dentine to the side of the said tooth, the vertical axis/longitudinal axis of the drill hole having been indicated by 3a. An indicating device is positioned in the first drill hole, which indicating device bears in the hole 3 via a bearing part 5a and has a part 5b protruding from the hole 3 as well as an indicating section 5c. In the present case the parts 5b and 5c form a common part, which in the case shown is formed as an essentially plate-shaped and rectangular part, which can be considered as a flag-shaped part. The indicating member can of course have other shapes. The part 5c has a free end surface 5d. The end surface 5d constitutes an indication to the surgeon or equivalent of where he or she should drill a second receiving hole 6, the longitudinal axis of which has been indicated by 6a. A drill instrument has been indicated by 7, and a marker drill associated therewith by 8. In the present case the holes are assumed to be essentially mutually parallel and essentially vertical. The longitudinal axis 2a of the tooth is also parallel with the axes 3a, 6a.

In Figure 2 the drill instrument 7' is shown with a starting drill 9. During the drilling work the end surface or side surface 5d' can serve as a support for the drill. The indicating device 5' indicates to the surgeon a distance A, which distance represents an optimal distance from the longitudinal axis 3a' to the vicinity of a position 10. In the figure a distance a is indicated which shows the distance between the end surface 5d' and the longitudinal axis 6a' of the second hole, which distance a can be between zero and a few mm. The recess 3' will in this case constitute an attachment hole for a first fixture which is symbolized partially in the figure by 11. This fixture is built upon in a known manner with material for building up the actual replacement part (tooth, dental bridge, etc.). In a corresponding manner the second receiving hole will constitute an attachment hole for a second fixture which is symbolized by 12 in Figure 2 and which represents a foundation on which the finished replacement part is built. The fixtures 11 and 12 can be separate. Alternatively, 11 and 12 can form fixture parts which are included in the same prosthetic reconstruction. In Figure 2 the axis of the tooth is indicated by 2a'.

Figure 3 shows that the state of parallelism can exist between the axes 2a", 3a" and 6a" even when the axes are steeply inclined. In this case too the end surface 5d" can constitute a support for the drill 9'. Alternatively, one or all of the axes can be nonparallel.

Figure 4 shows a view from above of the dentine 13 and of an indicating device 14. The indicating device has a shape corresponding to the above and can be pivoted about its common bearing and protruding part when it is applied in its first bearing hole (cf. 3 in Figure 1). In this case the end surface of the indicating device is shown

by 15 (= 5d in Figure 1). The indicating device can be pivoted in order to indicate the positions 16 and 17 for two second receiving holes for implants/fixtures. The said pivotability is shown by an arrow 18. In Figure 4 the receiving holes are placed along an essentially straight line 19.

Figures 5 and 6 show that the three receiving holes 16', 17' and 20, and 16", 17" and 20', respectively, can be arranged along a curve or, respectively, form a tripod shape 22.

The indicating device can also be used as a volume indicator in accordance with Figures 7 and 8 where, in Figure 7, dentine is shown from above by 23 together with two teeth 24 and 25. The indicator 26 in this case has two wings 26a, 26b which protrude from either side of the common bearing and protruding part 26 which is fitted in a bearing hole in accordance with the above. A 90° pivoting in the direction of the arrow 27 provides an indication for the replacement part to be fitted in the width direction B of the dentine 23.

Figure 8 shows the use of two indicating devices which provide the user with volume information in relation to the fixture shape.

Figures 9a, 9b and 9c show different lengths A', A'', A''' of the distance-indicating sections of the parts 30, 31 and 32, respectively. The parts 30, 31 and 32 have a function and shape corresponding to those of the indicating member 5 in Figure 1.

Figure 10a shows examples of height indicators 33, 34 and a volume indicator 35. Each height indicator is designed with horizontal or [lacuna] markings 33a, 33b, 33c etc. The volume indicator is provided with ring markings 35a, 35b, 35c, etc. An increasing volume (thickness) at the rear of the semispherical or half-cup-shaped body 35d is indicated by decreasing ring sizes, or vice versa. The surface which exhibits the ring markings (= the surface coinciding with the plane of Figure 10a) is preferably flat. The indicating devices are designed, in a manner corresponding to the above, with bearing parts 33', 34' and 35', respectively, arranged in recesses 36 in dentine 37.

Figure 10b shows the body 35d' with the bearing part 35" arranged in a recess 36' in the dentine 37'. The volume or thickness b is represented by ring markings corresponding to 35a, 35b, 35c in Figure 10a. The flat surface is represented by 35e.

Figures 10c and 10d show examples of how the indicating devices 33, 34 and, respectively, 35 can appear in side view.

In Figure 11 two teeth are represented by 36 and 37. In the space 38 between the teeth the height indicating devices 38 and 39 in accordance with the above are arranged in bearing recesses 40 and 41 in the dentine 42. A distance b can be determined by comparing the height markings 38a and 38b, and it is possible to decide whether an adjustment in height or drill depth of the holes 40, 41 should or should not be made.

The invention is not limited to the embodiment

shown hereinabove by way of example, but instead can be subject to modifications within the scope of the following patent claims and the inventive concept.

## Claims

1. Indicating device for marking out one or more attachment points (16, 17) for a fixture or fixtures (11, 12) on an area of the human body, preferably in the human jaw (1), it being possible for the device to be applied in a receiving hole (3), here called the first receiving hole/drill hole, in which it bears via a bearing part (5a) and from which it protrudes above the said area of the human body via a protruding part (5b), characterized in that the protruding part has an indicating section (5c) by means of which distances (A', A'', A''') to one or more neighbouring attachment points for the fixture or the fixtures can be determined.
2. Device according to Patent Claim 1, characterized in that the indicating section (33, 34) has height markings (33a, 33b, 33c) with which the height above the area of the human body can be determined.
3. Device according to Patent Claim 1 or 2, characterized in that it comprises a rod-shaped part (5a) which can be pushed into or down into the receiving hole (3), and a part (5c) which is angled in relation to the rod-shaped part and which forms the indicating section and which, with its free end surface (5d), indicates the position of the respective desired attachment point in relation to the first receiving hole (3) which itself also forms an attachment point for a fixture (11, 12) or fixture part.
4. Device according to any one of the preceding patent claims, characterized in that the indicating section (5c)/the angled part is in the form of a flag-shaped or rectangular part which is integrated with or connected to the said protruding part (5b).
5. Device according to any one of the preceding patent claims, characterized in that the bearing and protruding parts as well as the indicating section/the flag-shaped part can be rotated together or reciprocally in order to allow the indicating section (5c)/the flag-shaped part to rotate to different angular positions in relation to the longitudinal direction (3a) of the protruding part and thereby permit indication of the respective attachment point (16', 17') for the fixture or fixture part.
6. Device according to any one of the preceding patent claims, characterized in that the indicating section/the flag-shaped part is arranged to provide support for the instrument/drill (9, 9') upon formation of a second receiving hole (6) in the area of the human body, which second hole constitutes a seat for the attachment point of the fixture or fixture part in question, it being possible for the state of parallelism between the first and second holes to be determined.
7. Device according to any one of the preceding patent claims, characterized in that it is applied in the first receiving hole (20, 20'), can be pivoted for measuring-in the optimal distance to a second receiving hole (16' or 17'), and can thereafter be pivoted again for measuring-in a third receiving hole (17' or 16'), etc.
8. Device according to any one of the preceding patent claims, characterized in that it is provided with a number of height markings for indicating the optimal height of the fixture or fixture part above the area of the human body, and the indicating section can form the protruding part and can consist, for example, of a rectangular element associated with the bearing part.
9. Device according to any one of the preceding patent claims, characterized in that it is designed as a semi-spherical or half-cup-shaped body with a flat marking surface (35e) for volume markings (35a, 35b, 35c) for the body, which volume markings can be in the form of ring markings, where an increasing volume is indicated by a decreasing ring size, and vice versa.
10. Device according to any one of the preceding patent claims, characterized in that it forms part of a system of indicating devices, in which a first type of indicating device is used for indicating essentially horizontal optimal distances between attachment points for fixtures and preferably the parallelism between the longitudinal axes of the receiving holes, a second type of indicating device (33 or 34) indicates essentially vertical optimal heights for the fixture above the area of the human body, and a third type of indicating device (35) indicates the optimal volume-related (labial) shaping of the fixture/fixture part/replace-ment part in question, and one or two or all types of indicating devices (5, 33, 34, 35) can be present in various sizes and/or values for the respective indication.
11. Method which uses the indicating device (5, 33, 34, 35) according to Patent Claim 1, in which one or more attachment points (16', 17', 20) for one or more fixtures or fixture parts will be established in an area of the human body, for example in the jawbone (1), and a first receiving hole (3) is established in the area of the human body, characterized in that the

indicating device is introduced into a first receiving hole (3) via its bearing part (5a), and in that the position or positions (16', 17') for one or more neighbouring second receiving holes is/are determined with the aid of one or more indicating sections (5c) on the indicating device (5). 5

12. Method according to Patent Claim 11, characterized in that the indicating section (5c) or indicating sections is/are turned about the longitudinal axis (3a) of the first receiving hole for marking out the positions for the said two or more second receiving holes. 10

13. Method according to Patent Claim 11 or 12, characterized in that the height of the respective fixture or fixture part is determined with the aid of one or more height markings on the indicating device or the indicating section, and/or in that the volume of the fixture or fixture part in the receiving hole in question is determined using a volume-indicating device. 15 20

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Fig. 1

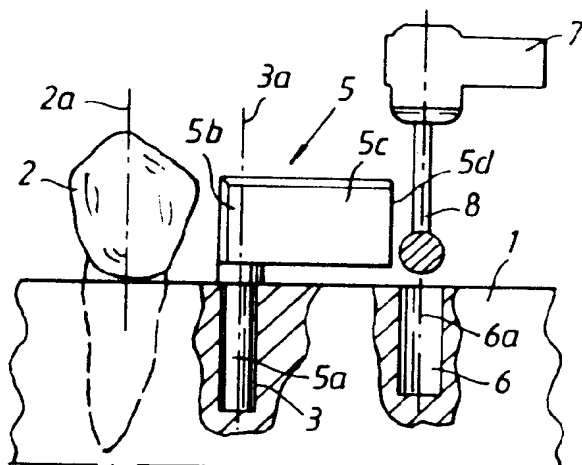


Fig. 2

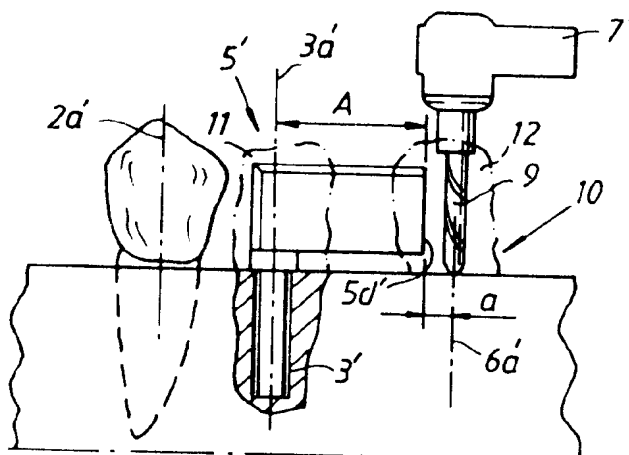


Fig. 3

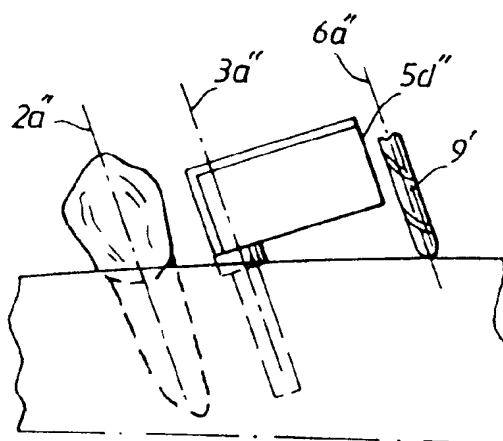


Fig. 4

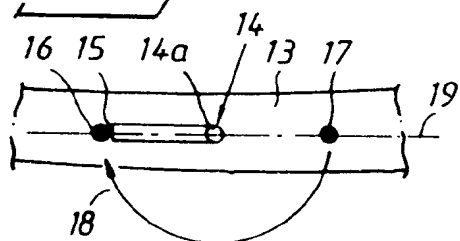


Fig. 5

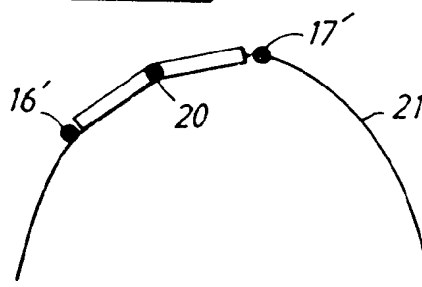


Fig. 6

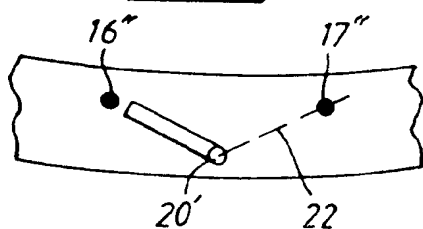


Fig. 7

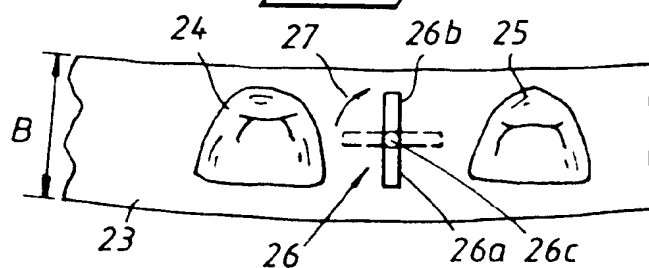


Fig. 8

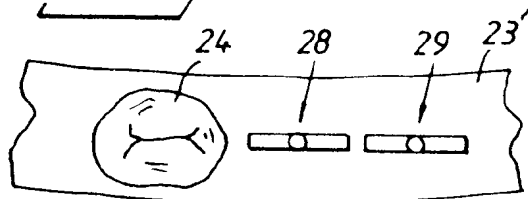


Fig. 9a

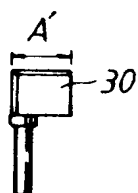


Fig. 9b

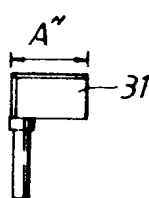
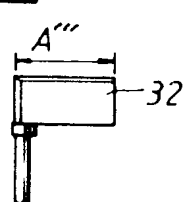
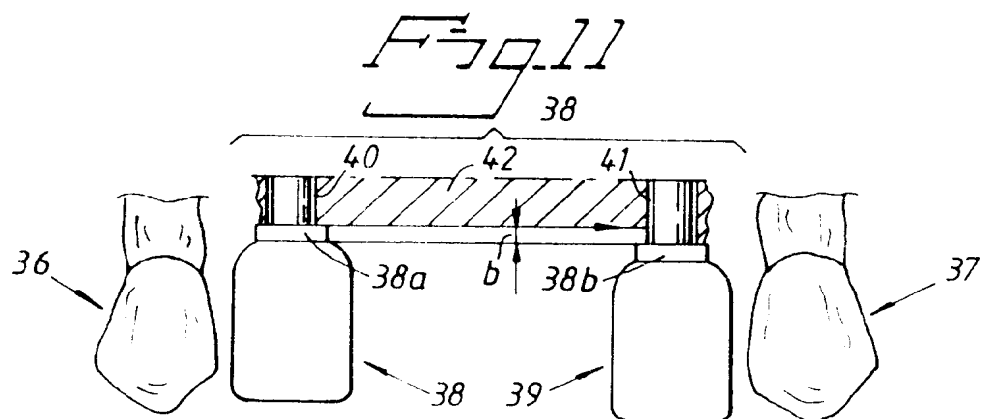
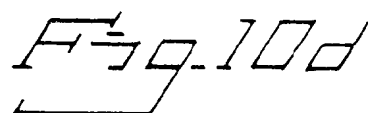
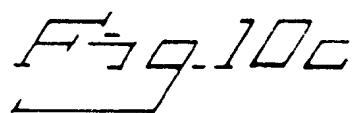
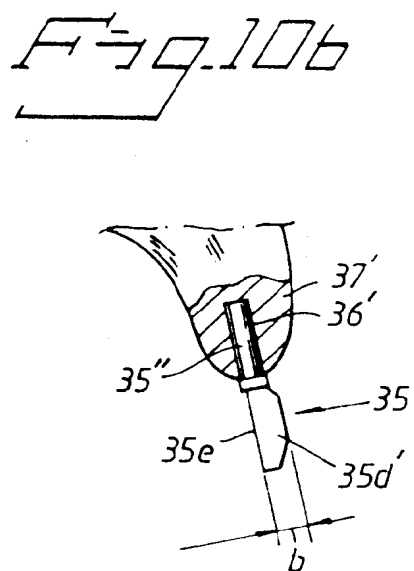
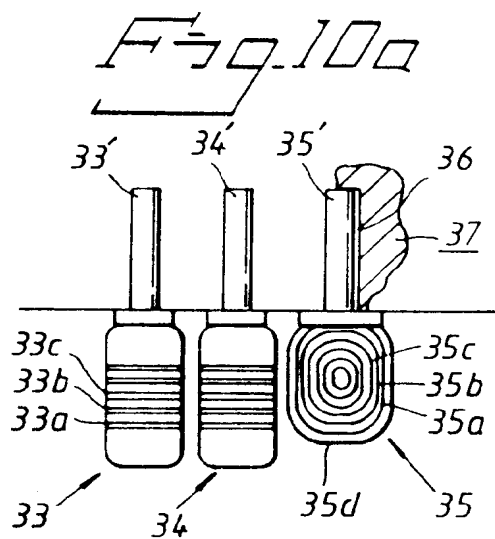


Fig. 9c









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**PARTIAL EUROPEAN SEARCH REPORT**  
which under Rule 45 of the European Patent Convention  
shall be considered, for the purposes of subsequent  
proceedings, as the European search report

Application number

EP 95850099.3

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.6)
X	WO, A1, 9400073 (UNIVERSITY OF MANCHESTER INSTITUTE OF SCIENCE AND TECHNOLOGY), 6 January 1994 (06.01.94) * page 11 last paragraph, page 12 first paragraph, figures 1-5 *	1-10	A61C 8/00
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X	US, A, 4251210 (BERNARD WEISSMAN), 17 February 1981 (17.02.81) * abstract *	1-10	
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			TECHNICAL FIELDS SEARCHED (Int. Cl.6)
			A61C
<b>INCOMPLETE SEARCH</b>			
<p>The Search Division considers that the present European patent application does not comply with the provisions of the European Patent Convention to such an extent that it is not possible to carry out a meaningful search into the state of the art on the basis of some of the claims.</p> <p>Claims searched completely:</p> <p>Claims searched incompletely:</p> <p>Claims not searched: 11-13</p> <p>Reason for the limitation of the search</p> <p>Method for treatment of the human or animal body by surgery or therapy (see article 52(4) of the European Patent Convention).</p>			
Place of search		Date of completion of the search	Examiner
STOCKHOLM		31 August 1995	HEDLUND J.
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